Lesson Plan

Water

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- Glossary of Water Terms

Grade Level

- K-8

Main Ideas

- Indiana's water came from the melting of glaciers at the end of the Ice Age, forming wetlands.
- Wetlands and watersheds perform many important duties for people that are often overlooked and they must be protected from pollution.
- Groundwater is water that is underneath the earth's surface; 72% of people in Indiana rely on groundwater for their drinking water.
- The porosity of an aquifer determines how much of any given pollutant can seep through into our groundwater.
- The water cycle carries water from one area to another, but can also carry pollution.
- There are two types of pollution: point source, and non-point source.
- Many careers at IDEM deal with protecting our water, but by following suggestions at home ordinary citizens can help out as well.

Objectives

Students will (1) learn about the history of Indiana's water and (2) come to understand how easily pollution can be contaminate our water supply. They will also learn (3) how relatively small our supply of fresh water is and why we need to protect it. Lastly, they will come to understand (5) how both simple steps and science can be used to keep our water clean.

Materials Needed

- clear storage container
- sand and/or fine gravel
- pump from a soap/lotion dispenser
- unsweetened powdered drink mix
- cup with holes in the bottom
- clear cup or container
- paper towels
- a water source

Teacher Preparation

For use when a teacher is giving the presentation on his or her own

Overview

This presentation is designed teach students about Indiana's water supply and what a valuable natural resource it is.

Materials Needed

This presentation's activities require the use of water. Please plan to locate the presentation near a water source to keep messes at a minimum.

Additional Resources

Check out the "Taking it further" section for other activities that can help you integrate this presentation into a larger lesson plan or thematic unit, follow-up the presentation with more activities, or simply give you ideas for future lesson plans.

The Indiana State Science Standards covered in this program have also been provided for you, allowing you to cover the standards with an environmental twist. Furthermore, a glossary of water terms covered in the presentation is provided at the end of this lesson plan.

Presenter Preparation

For IDEM staff members giving the presentation

Overview

This presentation is designed teach students about Indiana's water supply and what a valuable natural resource it is.

Materials Needed

You should prepare the materials you are to bring prior to your presentation. Contact Chad Trinkle at (317) 233-9479 with any questions you may have regarding where to find them or how to use them.

- Clear Storage Container
- Sand and/or fine gravel
- Pump from a soap/lotion dispenser
- Unsweetened powdered drink mix
- Cup with holes in the bottom
- Clear up or container
- Paper towels

Remind the teacher you are presenting for to have a water source available for you in the area in which he/she will be having you present.

Presentation Tips

- Read through the presentation beforehand to become comfortable with the information presented and to identify any alterations you want to make.
- The outlined presentation is merely a rough guideline. You are not expected to get through all the information available; feel free to pick and choose which parts to present based on time constrictions, your personal preferences, and age of your audience.
- Younger audiences are more likely to get restless, so be sure to keep them entertained.
- Provide positive feedback to your students as you go. Be sure to smile at them and encourage them to participate.
- Instructor enthusiasm is contagious. Have fun!

Lesson & Activities

A. Introduction

Did you know that we all live in a world of water?

Take our own bodies for example: 66% of our bodies are made of water! Even bones are 25% water. 70% of the earth's surface is water, and 97% of that water is found in our oceans and seas. While this may seem like an awful lot of water, we cannot drink most of the earth's water because it is salt water. We cannot make new water…the water we have now is the only water we will ever have, and we can only try to protect the water we have now from pollution so that we have enough clean water for all of us (plants and animals too) to stay healthy!

B. History of Indiana's water, waterways, and wetlands

Did you know that the water we have here in Indiana came from giant sheets of ice called glaciers that melted at the end of the last ice age?

When these glaciers melted, they formed huge puddles of water, which formed our Great Lakes and much of the smaller lakes, ponds, rivers and streams we have in Indiana. For thousands of years, Indiana and most of the surrounding states that make up the Midwest were covered in boggy areas of water that we call wetlands, or "swamps." Over one hundred years ago, early American settlers began moving into Indiana in search of new farm land. They began draining many of the fields so they could farm the land. These wetlands provided a lot of nutrients, and when they drained the land of water, this left rich soil deposits which is why the Midwest's soils are some of the richest in the world! However, now that we have fewer wetlands, we must be extra careful of how we treat the land, so that we protect the wetlands we do have. Wetlands are very important because they provide a home for so many plants and animals. This is why we need to be careful about protecting the water, not only for ourselves, but also for all the creatures that call Indiana home.

C. The Importance of Wetlands

Can anyone explain what a wetland is? Why are wetlands important?

A wetland is an area that is wet (for at least part of the year) and water-loving plants love to grow. Wetlands are often in-between places; they lie between deep water (such as lakes and streams) and dry land.

The majority of Indiana's wetlands have been drained, filled in, and converted to other uses. When the first European settlers arrived in Indiana, almost one fourth of the state was covered in wetlands. Since then about 85% of these original wetlands have been lost, leaving less than 4% of the state in wetlands. The wetlands that remain are scattered all over the state.

Wetlands perform many important duties for people.

- They clean the water we drink: Wetlands are nature's water filters. They trap and remove mud, silt, and other particles carried by water that runs off the land. They can remove excess fertilizer, human and animal waste, and even some pesticides and heavy metals.

- Wetlands keep homes from flooding: Like giant sponges, wetlands can soak up huge amounts of rainwater. This helps to reduce or prevent flooding. They also slow down the flow of water across the land, which reduces soil erosion and damage to stream banks, roadways, and buildings.
- Wetlands provide places for many kinds of animals and plants to live

Nationwide, about 900 different kinds of wildlife need wetlands at some time in their lives, and nearly half of all endangered wildlife depends on wetlands for their survival. Beavers and muskrats are examples of Indiana wildlife that are totally dependent on wetlands.

D. Watersheds in Indiana

Did you know that we all live in a watershed? Who knows what a watershed is? Does anyone know which watershed you live in?

A watershed is the land area that drains water (rainfall, snowmelt) to a stream, river, lake, or ocean. Watersheds are in hilly or mountainous areas as well as in flat areas. Watersheds also come in many shapes and sizes, from as small as an acre or two that drains into a pond to millions of square miles like the land that drains into the Gulf of Mexico. We all live in a watershed-it is our ecological address!

It's important to take care of watersheds because they provide homes and water for all living things. As water drains into the lowest area of a watershed, it will pick up soil, and other small particles such as oil, road salt, fertilizers, pesticides, or other pollutants. All of these small particles are then carried into our waterways where they accumulate and become hazards for all who depend on and use this water.

E. Groundwater

Does anyone know what groundwater is or what makes it so special to us? Why is it important that we protect groundwater?

Groundwater describes the water that is underneath the earth's surface. There are open spaces in the rocks below the earth's surface where groundwater can accumulate (compare groundwater to water in a sponge…emphasize that groundwater does NOT occur as underground lakes and rivers). When it rains or when snow melts some of the water soaks into the soil and down into the rock below (recharge).

An aquifer is an underground body of sand, gravel, or rock that is filled with water and is capable of supplying enough water to a well.

96% of fresh water in the U.S. is groundwater. 72% of people in Indiana rely on groundwater for their drinking water.

Activity # 1[1]

Human Aquifer
A demonstration for the entire class.

Purpose: To help the students understand how an aquifer works, and the differences in porosity between clay, gravel, and sand aquifers

Materials: At least ten students.

Instructions:

Begin by choosing one student to be the water (for older students, this person can instead represent an oil spill) that is going to travel through the aquifer. Have the rest of the class stand in the middle of the room. First, have the class be a gravel aquifer, standing an arms length apart. Instruct the "water" to try to move from one side of the group to the other, moving through his or her classmates. When the "water" arrives at the other side, ask how hard it was to get through the "gravel" (he/she should say "easy"). Repeat, but instead have the class be a sand aquifer. Instruct them to take one step towards one another and to put their hands on their hips. Again, ask the "water" how hard it is to get through the "sand" (a little more difficult). Lastly, have the class be a clay aquifer. Have the students take one more step towards the center of the group and place their arms at their sides. The "water" should struggle to get through.

Discussion/ Follow-up: Ask the class which type of aquifer was the easiest and which was the hardest for the water to get through. Ask them what made it easier to get through the gravel than the clay. Explain to them the concept of porosity-the spaces between the pieces were smaller therefore, the oil had a harder time getting through. Lastly ask which type of aquifer we would hope was in place if an oil spill took place in real life.

F. The Water Cycle

The water cycle is a continuing cycle of water flowing from land and sea (or any body of water) to the atmosphere and back again.

Water evaporates from oceans, lakes, and streams into the atmosphere. Later the water returns to the land in the form of rain or snow, where it evaporates again or runs off into the streams and rivers (watershed area) or soaks down into the ground to become groundwater. Groundwater eventually seeps into streams and lakes or flows to the oceans and evaporates . . .and the cycle begins again (explain how not every drop of water follows the same cycle path-sometimes it may remain in one spot for a very long time. Example: glaciers)

Just as water moves in the water cycle (from groundwater to streams/lakes and vice versa, etc.), so can water pollution. Contaminated groundwater can pollute streams/lakes, and contaminated streams/lakes can pollute groundwater.

G. Pollution

Pollution occurs when a substance changes the physical, chemical, or biological properties of the water, air, land and makes it harmful to use (contamination).

[1] Adapted from an activity on the back of a USGS Ground Water Poster.

Water pollution is pollution that has entered our lakes, ponds, streams, oceans, etc. and is unhealthy for the plants, and animals that depend on this water to live. This includes people too! Think of the many ways in which we depend on water to live. Water equals life! Pollution can be divided up into two basic categories: Point Source pollution and non-point source pollution.

1. **Point Source Pollution:**
   This is pollution that comes from a specific "point" or place, such as a pipe. It is easier to find where point source pollution is coming from, because you can normally just follow the pollution back to where it is flowing or leaking from.
   Examples:
   Pipes that either carry liquids or smoke away from some place (such as a factory, a sewage treatment plant, or even from our homes).
2. **Non-Point Source Pollution:**
   Non-point source pollution describes the pollution that water picks up as it flows across a surface such as our lawns, streets, farm fields, or a construction site. After it rains, water travels across these surfaces, picking up "stuff" along the way and then flows into streams, drainage ditches, or soaks down into the ground.
   Examples:
   Pesticides, herbicides (weed killers), fertilizers, or soil from farm fields and lawns; motor oil and other chemicals that run off of streets; chemicals that seep into the ground from landfills; bacteria and nutrients from farm animals, pets, or faulty sewage systems.

Activity # 2[2]

"Aquifer in a pan"
A demonstration for the entire class.

Purpose: To provide a visual tool to show how water is stored in an aquifer, and how drinking water can become contaminated by human activities that occur near the Earth's surface

Materials: Clear container, sand and/or fine gravel, pump from a soap/lotion dispenser, unsweetened powdered drink mix, cup with holes in the bottom, cup or container (to hold water pumped from aquifer), paper towels, and a water source.

Instructions:

Arrange the sand/gravel in such a way that there is a lake at the end of the container. Slowly add water to the container so that there is a visible ground water layer within the sand or gravel and water in the pond. Leave enough space for the aquifer to be "recharged" (additional water can enter the aquifer). Insert the pump dispenser into the landscape for a well. Explain to the students that you will demonstrate some aspects of the interactions between groundwater and surface water. Have one student volunteer hold the cup with holes in it over the sand/gravel. Ask the class what they think this represents, and then explain to them that this water entering the "lake" is like rain entering a real lake. Next explain how the water enters the sand or gravel and becomes groundwater (infiltration); also point out the top of the groundwater, the water table. Have several students take turns pumping the water into a regular cup while discussing what happens to the water table/aquifer/lake as they are pumping. Now pour ½ packet of unsweetened drink mix onto the aquifer. Allow a few students to take turns pumping the water from the "well" into a cup. Ask the students what the drink mix represents (pollution) and ask them what the source of the pollution might be (fertilizer, pesticides, acid deposition, oil, etc.) Also point out how the aquifer and lake are connected and how the pollution can spread.

Discussion/ Follow-up: Have the students observe how long polluted water is pumped from the well. Inform them that 72% of Indiana residents get their drinking water from groundwater. Make sure they realize that this is the same situation in real life and how easily pollution can get into our groundwater/drinking water.

H IDEM Water Careers

There are a lot of different careers in the Office of Water Quality (OWQ) that deal with protecting our State's water resources. Here are just a few examples:

- Environmental scientists and biologists in the Water Assessment Branch sample and assess the quality of the state's rivers, streams, and lakes. They take water samples and look at the fish & bugs in the stream to determine the healthiness of the stream, and to identify potential pollution problems.
- The overall goal of the Drinking Water Branch is to protect the quality of our drinking water supplies. They do this by making sure that the water provided by public water supply systems is of good quality and meets drinking water standards, and also by helping to protect the groundwater from which the drinking water is derived.

[2] Adapted from an activity on the back of a USGS Ground Water Poster.

- The Clean Water Act prohibits the discharge of a pollutant into the "waters of the United States" as a point source discharge without a permit (NPDES-National Point Discharge Elimination System). People in several sections of the Office of Water Quality are responsible for enforcing this program. They deal in various capacities with wastewater treatment plants and other facilities-issuing permits, monitoring and inspecting the facilities to make sure they are complying with their permit, etc.
- One of the primary responsibilities of the Water Quality Standards Section is to protect the State's wetlands from being eliminated or destroyed by construction activities.

Some sections within OWQ administer grant or loan programs to help groups or communities improve water quality. For example, the Watershed Management Section gives out grants for projects that reduce nonpoint source pollution. The State Revolving Fund Section administers a low-interest loan program to help communities improve their wastewater treatment plant or drinking water plants.

I. What can you do?

- Make sure the cleaning products in your home are safe and biodegradable (look for "phosphate free" products)
- Avoid using harmful chemicals when gardening or doing yard work. Many plants (marigolds), insects (ladybugs), and animals (birds) can do a better job at keeping bad bugs away rather than harmful pesticides.
- Plant grass, trees, etc any place in your yard where there is bare soil or cover it the area with mulch, straw, etc. to avoid more soil being washed away when it rains (erosion).
- Conserve Energy: turn off lights when not in use, replace old bulbs with energy-efficient compact fluorescent bulbs. Conserving electricity reduces the amount of acid rain produced by coal-burning power plants that make our electricity.
- Do not pour any harmful chemicals down the drain (paints, motor oil, etc) or down storm drains along the streets. Take used motor oil to a service station for recycling.
- Read the label of all chemicals used at home (indoors, yard, garage, etc) to find out how to properly use and dispose of it.
- Conserve water! Everyday each of us uses about 150 gallons of water. Most of that goes down the drain without being used. And very little of that is used for drinking.
- Find ways you can use less water around your home: Turn off the faucet while brushing your teeth, put a plastic bottle filled with water in the toilet tank to cut down on water needed for flushing, only run the dishwasher or washing machine when you have a full load that needs cleaning.

J. Conclusion

IDEM takes clean water and your health very seriously.

If all the suggestions made were followed, they would make a huge impact on keeping the water clean. That is why it is so important for everyone to think like an environmental scientist even if becoming one is years away!

Taking it Further

IDEM's presentations are designed to suit both the environmental scientist with no experience in the classroom and the experienced educator who wants to give his or her students a fresh learning experience.

However, there are a few things that the trained teacher can offer that are not possible to replicate in a short presentation. This section provides that teacher with additional activities that can be used in place of or in addition to the ones in the lesson.

Additional Activity #1[3]

In/Out of the Stream

An activity for grades K-3

Purpose: To challenge students to think about what can be "good" and "bad" in a stream

Materials: various objects (some that belong in a stream, some that do not) and a box with tall sides

Instructions: Have each student draw an item out of the box without looking. Draw an imaginary line down the center of the room and have the students line up on it. Explain to them that this is an unhealthy stream. Next, give the students a short amount of time to decide whether or not they (their objects) are contributing to the pollution of the stream. Those that believe they do not belong should stand in an area designated for pollution.

Discussion/Follow up: After the students have sorted themselves out, go through one by one and discuss each item. Ask the students why they are okay or not okay in the stream, and how the items that are not okay could have gotten into a stream. Also discuss with students what they can do to make sure these items do not end up in the water.

Example Items:

OKAY IN THE STREAM	KEEP OUT OF THE STREAM
Fish	Trash (various items)
Algae	Too much algae
Plants	Fertilizer
Dirt	Too much dirt
Bugs	Pesticides
Trees	Detergents
Sticks/Leaves	Bacteria
Rocks/Gravel	Oil/Gas
Oxygen	Sewage
	Manure

[3] Adapted from Lake County SWMD Enviromobile Water Lessons.

Additional Activity #2[4]

The Thunderstorm

An activity for the entire class.

Purpose: To teach students about the various stages and sounds of a thunderstorm

Materials: At least ten students

Instructions: Ask the students to stand in a semicircle or line in front of you. Explain to them that as you make eye contact with each student he or she should begin to imitate your action. Each student should continue making their motion until you pass him/her and signal the student to do the next motion. Start with a student at one end of the line and begin making the first motion. He or she should imitate it and continue doing it as each student you pass joins in. Return to the beginning of the line, and continue with a different motion. One by one, the students should switch to this new motion creating a crescendo of sound that imitates the passing of a thunderstorm.

Use the following motions, in this order:

1. Rub hands together
2. Snap your fingers
3. Clap your hands in an irregular pattern
4. Slap your hands on your legs
5. Stomp your feet
6. Slap your hands on your legs
7. Slap your hands on your legs AND stomp your feet
8. Stomp your feet
9. Slap your hands on your legs
10. Clap your hands in an irregular pattern
11. Snap your fingers
12. Rub your hands together
13. Rub your hands together
14. Open palms (quiet)

Discussion/Follow up: Discuss the motions and what they represent. Also discuss how thunderstorms play a part in the water cycle.

[4] Adapted from notes taken during a presentation where a thunderstorm simulation was given.

Additional Activity #3

The Farmer and the Well

A demonstration for the entire class.

Purpose: To teach students the difference between point and non-point source pollution, and how easily non-point sources can pollute our water

Materials: Large clear container, imitation grass doormat, 1 cup of dirt and a container to keep it in, food coloring, water source, spray bottle, cup with holes in the bottom, regular cup

Instructions: Fill the plastic container with 2 inches of water, and drape the doormat over the side of the container to create a large grass "hill." Explain to the students that this is hill is on a farm and that many animals like to drink from the pond at the bottom. Also explain to students that although it is sometimes easy to see where is pollution is coming from, like when a factory is making air pollution we can see, sometimes it is not so easy. Next explain that in order to grow crops on the hill, the farmer uses a tractor and other machinery as well as pesticides and fertilizers. Add the dirt to the hill to represent the planting of the farmer's crops. Then use the food coloring, one color at a time to represent the addition of chemicals, pesticides, and the leakage of oil from tractors. Now ask the students what they think these chemicals will do to the water when it rains. Use the spray bottle to imitate a light rain by spraying it directly onto the "hill" and have the students observe what happens. Next fill a large cup with water and pour into the cup with holes in the bottom to imitate a rainstorm. Have the students make new observations about what has happened to the water.

Discussion/Follow up: Explain to students that point source pollution occurs when we can tell where it is that the pollution is coming from. Then explain the concept of non-point source pollution using the demonstration above. Ask them to imagine what would happen in the aquifer if this water was running into the groundwater and a well was inserted. Although the water would be polluted, we would not be able to point to the polluter (non-point pollution).

Additional Activity #4

Edible Aquifer

An activity for the entire class.

Purpose: To give students a fun and easy explanation of the geology of an aquifer

Materials: Blue or red food coloring, vanilla ice cream, clear soda pop, crushed ice, variety of colored cake decoration sprinkles or sugars, drinking straws, clear plastic cups

Instructions: Give each student a clear plastic cup. Have each student fill their 1/3 of their cup with crushed ice to represent gravel and soil and add just enough soda to cover the ice. Next add a layer of ice cream to serve as a confining layer over the water-filled aquifer. Explain that this layer would usually be bedrock or clay, and it restricts the flow of water underground. Now have the students add more ice (gravel) on top of the ice cream. Use the sprinkles and sugars to represent the soil that creates the porous top layer. The students should now have a completed model of an aquifer. Point out the water table and other aspects of a real aquifer. Ask the students what they think the result would be if pollution got into their aquifers. After discussing this for a while, use the food coloring and add a little to each cup to represent contamination. Then use a straw to dig a well into the middle of each aquifer. Slowly begin to pump the well by sucking on the straw. Observe the decline in the water table and how easily the contaminants can get sucked into the well area and end up in the groundwater by leaking through the confining layer. Recharge the aquifer by adding more soda to represent the way a rain shower would recharge a real aquifer.

Discussion/Follow up: Review what you have learned as you enjoy eating your edible aquifer!

Additional Activity #5

A Wealth of Water

A demonstration for the entire class[5].

Purpose: To help students understand how precious our Earth's water is by using fractions that they can understand

Materials: Pretend money, index cards labeled as follows: oceans, lakes, rivers, atmosphere, glaciers, and groundwater

Instructions:

Prepare the money ahead of time with the following breakdown equaling $100:

- 4 -- $20 bills
- 1 -- $10 bill
- 1 -- $5 bill
- 4 -- $1 bills
- 2 -- quarters
- 4 -- dimes
- 1 -- nickel
- 5 -- pennies

Begin by asking the students to raise their hands and tell you where they think most of the earth's water is. The person who correctly answers oceans will receive the index card that says OCEANS on it. Continue asking where the NEXT most water is on earth (give them hints if they are stumped, particularly with atmosphere and groundwater) and giving the correct guesser the card for the given place. Once all six cards have been distributed, explain to the students that you have $100 that represent all of the water on Earth. Tell them that each of the places on earth that holds water will get some of that money, depending on how much water it can hold. Now have the students guess, starting back with oceans, how much money each place will receive and distribute the appropriate amounts.

Discussion/Follow up: Ask the students how the real numbers compare to their expectations. Ask them to think of all the lakes and rivers they have seen and how little water is held there compared to the oceans, which are filled with salt water. This activity can be done in conjunction with the "Usable Fresh Water" demonstration on the following page to explain to students how little of this water can be used.

Information needed for this activity:

1. Oceans, $97.20
2. Glaciers, $2.00
3. Groundwater, $00.62
4. Atmosphere, $00.10
5. Lakes, $00.05
6. Rivers, $00.03

[5] Adapted from a Lake County SWMD activity.

Additional Activity #6[6]

Usable Water Demonstration

A demonstration for the entire class.

Purpose: To help students understand how little of the water on Earth is actually suitable for drinking

Materials: One 2-Liter plastic bottle filled with water, one .5 Liter cup filled with water, 1 teaspoon or ½ teaspoon measuring spoon, a water source

Instructions:

Tell the students to imagine that you have 50 2-liter bottles just like the one you have and that they represent all of the water on earth. Ask them what the problem is with most of this water that prevents us from drinking it (it is salt water). Next hold up the 2-liter bottle and the cup and tell them that these represent the fresh water on earth, but that there is a problem with some of this water. We cannot get to all of the fresh water so there is even a smaller amount we can use. Demonstrate how much this is by holding up only the cup, and explain that this is the amount of available fresh water. Lastly, tell the students that of this fresh water, some the fresh water that is available to us is polluted and unusable. Dip the teaspoon into the cup, and fill it half way (or use a ½ teaspoon measuring spoon) and explain that out of all the water on Earth (remind them of the 50 2-liter bottles) this tiny bit is the amount of usable water left.

Discussion/Follow up: Ask the students how the results compared to their expectations. This activity is suitable for use in conjunction with the activity "A Wealth of Water" on the previous page.

[6] Adapted from an Internet handout researched by IDEM Americorp staff in 1999.

Indiana State Science Standards Covered in this Presentation (K-6)

Please Note

These Indiana State Science Standards apply only to the Lesson & Activities section of this lesson plan.
They do not apply to the Taking it Further: Additional Activities section.

Kindergarten

Scientific Inquiry

K.1.1 Raise questions about the natural world.

The Scientific Enterprise

K.1.2 Begin to demonstrate that everyone can do science.

Forces of Nature

K.3.2 Investigate that things move in different ways, such as fast, slow, etc.

Models and Scale

K.6.1 Describe an object by saying how it is similar to or different from another object.

First Grade

Scientific Inquiry

1.1.1 Observe, describe, draw, and sort objects carefully to learn about them.

1.1.2 Investigate and make observations to seek answers to questions about the world, such as "In what ways do animals move?"

Communication Skills

1.2.6 Describe and compare objects in terms of number, shape, texture, size, weight, color, and motion.

The Earth and the Processes that Shape It

1.3.1 Recognize that water can be a liquid or a solid and can go back and forth from one form to the other.

1.3.4 Investigate by observing, and then describe how things move in many different ways, such as straight, zigzag, round-and-round, and back and forth.

Interdependence of Life

1.4.4 Explain that most living things need water, food, and air.

Models and Scale

1.6.1 Observe and describe that models, such as toys, are like the real things in some ways but different in others.

Second Grade

The Earth and the Processes that Shape It

2.3.1 Investigate by observing and then describe that some events in nature have a repeating pattern, such as seasons, day and night, and migrations.

2.3.3 Investigate by observing and then describing chunks of rock and their many sizes and shapes, from boulders to grains of sand and even smaller.

Models and Scale

2.6.2 Observe and explain that models may not be the same size, may be missing some details, or may not be able to do all of the same things as the real things.

Third Grade

Reasoning and Uncertainty

3.5.5 Explain that one way to make sense of something is to think of how it relates to something more familiar.

Models and Scale

3.6.3 Explain how a model of something is different from the real thing but can be used to learn something about the real thing.

Constancy and Change

3.6.4 Observe that and describe how some changes are very slow and some are very fast and that some of these changes may be hard to see and/or record.

Fourth Grade

The Earth and the Processes that Shape It

4.3.3 Identify salt as the major difference between fresh and ocean waters.

Models and Scale

4.6.3 Recognize that and describe how changes made to a model can help predict how the real thing can be altered.

Fifth Grade

The Scientific Enterprise

5.1.3 Explain that doing science involves many different kinds of work and engages men, women, and children of all ages and backgrounds.

Technology and Science

5.1.6 Explain how the solution to one problem, such as the use of pesticides in agriculture or the use of dumps for waste disposal, may create other problems.

Forces of Nature

5.3.12 Explain that objects move at different rates, with some moving very slowly and some moving too quickly for people to see them.

Sixth Grade

The Scientific Experience

6.1.4 Give examples of employers who hire scientists, such as colleges and universities, businesses and industries, hospitals, and many government agencies.

6.1.5 Identify places where scientists work, including offices, classrooms, laboratories, farms, factories, and natural field settings ranging from space to the ocean floor.

The Earth and the Processes that Shape It

6.3.8 Explain that fresh water, limited in supply and uneven in distribution, is essential for life and also for most industrial processes. Understand that this resource can be depleted or polluted, making it unavailable or unsuitable for life.

6.3.9 Illustrate that the cycling of water in and out of our atmosphere plays an important role in determining climatic patterns.

6.3.13 Identify, explain and discuss some effects human activities, such as the creation of pollution, have on weather and atmosphere.

6.3.16 Explain that human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and farming intensively, have changed the capacity of the environment to support some life forms.

Reasoning and Uncertainty

6.5.5 Explain the strengths and weaknesses of using an analogy to help describe an event, object, etc.

Models and Scale

6.7.2 Use models to illustrate processes that happen too slowly, too quickly, or on too small a scale to observe directly, or are too vast to be changed deliberately, or are potentially dangerous.

Glossary of Water Terms

Clay Liner

The first layer of a landfill, used in conjunction with a plastic liner to reduce seepage of contaminated fluids into the groundwater and soil

Aquifer

An underground geological formation, or group of formations, capable of storing and supplying significant volumes of water to a well or spring

Watershed

An area from which a surface water or ground water system derives its water. Watersheds are typically divided from one another by topographically high ground.

Glacier

A large body of ice moving slowly down a slope or valley or spreading outward on a land surface

Wetland

A lowland area saturated with water

Groundwater

The supply of fresh water found beneath the land surface, usually in aquifers, which fills the spaces and moves between the soil particles and rock below the water table

Water cycle

The continuous movement of water from ocean to air and land then back to the ocean in a cyclic pattern

Point-source pollution

An identifiable and confined discharge or emission point for one or more pollutants

Non-point source pollution

An unconfined, usually broad, discharge or emission; Examples would be runoff from agricultural fields and streets and air deposition of chemicals.